

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

Applicants : KIM et al.  
Serial No. : 10/581,766 (U.S. Patent Application Publication 2007-0260027 A1)  
Filing Date : 6 June 2006  
For : **PROCESS FOR PREPARING PHENOLIC POLYMER BY  
USING PHENOTHIAZINES MEDIATOR**  
Examiner : HEINCER, Liam J.  
Art Unit : 1796

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**DECLARATION UNDER 37 C.F.R. § 1.132**

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I, Dr. SONG, Bong Keun of 109-804 Hanwool Apt., 160-1 Sinseong-dong, Yuseong-gu,  
Daejeon 305-707, Republic of Korea, a citizen of KOREA, hereby declare:

- that I am an polymer chemist having studied at Inha University, South Korea (ROK).
- that I have a Ph.D. in polymer chemistry which was awarded to me by Inha University in 2002 (Thesis: Synthesis of Polyacrylamide and Cationic Polyacrylamide by Heterogenous Polymerization);
- that I have been employed as a principal research scientist for the Korea Research Institute of Chemical Technology (KRICT) since 1985;
- that I am presently employed as the Director of the Chemical Biotechnology Research Center (Green Chemistry Division) of KRICT;
- that I am the author or co-author of the following publications:

Yong Hwan Kim, Eun Suk An, **Bong Keun Song**, Dong Shik Kim, and Rahul Chelikani, "Polymerization of cardanol using soybean peroxidase and its potential application as anti-biofilm coating material", *Biotechnology Letters*, **25**, 1521–1524 (2003).

Keehoon Won, Yong Hwan Kim, Eun Suk An, Yeon Soo Lee, and **Bong Keun Song**, “Horseradish Peroxidase-Catalyzed Polymerization of Cardanol in the Presence of Redox Mediators”, *Biomacromolecules*, **5** (1), 1-4 (2004).

Yong Hwan Kim, Keehoon Won, Jeong Mi Kwon, Hyun Seong Jeong, Seung Young Park, Eun Suk An, and **Bong Keun Song**, “Synthesis of polycardanol from a renewable resource using a fungal peroxidase from *Coprinus cinereus*”, *Journal of Molecular Catalysis B: Enzymatic*, **34**, 33–38 (2005)

Yong Hwan Kim, Eun Suk Ana, Seung Young Park, Jeong-O Lee, Ji Hyun Kim, and **Bong Keun Song**, “Polymerization of bisphenol a using *Coprinus cinereus* peroxidase (CiP) and its application as a photoresist resin”, *Journal of Molecular Catalysis B: Enzymatic*, **44**, 149–154 (2007)

Yong Hwan Kim, Eun Suk An, Seung Young Park, and **Bong Keun Song**, “Enzymatic epoxidation and polymerization of cardanol obtained from a renewable resource and curing of epoxide-containing polycardanol”, *Journal of Molecular Catalysis B: Enzymatic*, **45**, 39–44 (2007)

Yong Hwan Kim, Eun Suk An, and **Bong Keun Song**, “Co-polymerization of MTPC (methylene tri *p*-cresol) and *m*-cresol using CiP(*Coprinus cinereus* peroxidase) to improve the dissolution characteristics of the enzyme-catalyzed polymer”, *Journal of Molecular Catalysis B: Enzymatic*, **56**, 227–230 (2009).

Seung Young Park, Yong Hwan Kim, Keehoon Won, and **Bong Keun Song**, “Enzymatic synthesis and curing of polycardol from renewable resources”, *Molecular Catalysis B: Enzymatic*, **57**, 312–316 (2009).

Su Jin Kim, Jeong Ah Lee, Keehoon Won, Yong Hwan Kim, and **Bong Keun Song**, “Functional expression of *Coprinus cinereus* peroxidase in *Pichia pastoris*”, *Process Biochemistry* **44**, 731–735 (2009).

Sang Cheol Kim, Yong Hwan Kim, Hyuk Lee, Do Young Yoon, and **Bong Keun Song**, “Lipase-catalyzed synthesis of glycerol carbonate from renewable glycerol and dimethyl carbonate through transesterification”, *Journal of Molecular Catalysis B: Enzymatic*, **49**, 75–78 (2007).

Jae Kwang Song, Hyun Suk Kim, Hyo Jeong Ahn, **Bong Keun Song**, and Joon Shick Rhee, “Heterologous ABC exporter-based cloning of gram-negative bacterial type I secretion pathway-dependent metalloproteases from an *Erwinia* genomic DNA library in *Escherichia coli*”, *Enzyme and Microbial Technology*, **39**, 1190–1196 (2006).

Jae Kwang Song, Hyo Jeong Ahn, Hyun Suk Kim, and **Bong Keun Song**, “Molecular cloning and expression of perhydrolase genes from *Pseudomonas aeruginosa* and *Burkholderia cepacia* in *Escherichia coli*”, *Biotechnol Lett*, **28**, 849–856 (2006).

I am a named inventor of U.S. Ser. No. 10/581,766 (“the ‘766 application”) filed on 6 June 2006.

I am familiar with the invention described in the ‘766 application and understand that our representative met with the Examiner (Liam J. Heincer) and his supervisor (Mark Eashoo) to discuss the ‘766 application. It was reported to that one means of overcoming the rejections of record was to show additional test data to further support the assertion of unexpected results.

I have conducted additional experiments with other mediators other than the claimed mediators using the same process as of Example 1 of the present application to show that other non-inventive mediators have little favorable effect on the yield of the claimed reaction.

As can be seen from the following Table, mediators (other than the claimed mediators), which are conventional well-known mediators in the art as can be shown in *Chem. Res. Toxicol.* 1996, 9, 476-483, (see especially, Table 2 and left column of page 480), did not favorably affect the yield of the phenolic polymer, that is, they led to little polymerization of cardanol. On the other hand, the claimed mediators have resulted in much increased yield in the polymerization as can be seen from the Tables 2 and 3 of the present application.

Conc. of mediators	30μM		74μM	
Mediators	Yield (%)	Mean molecular weight(M <sub>w</sub> ) (Measurement with GPC)	Yield (%)	Mean molecular weight(M <sub>w</sub> ) (Measurement with GPC)
Trifluoperazine Dihydrochloride	0	-	8.3	7,100
2,2'-azino bis(3-ethylbenzthiazoline-6-sulphonic acid)	0	-	11.5	5,710
Promethazine Hydrochloride	0	-	0	-
Chlorpromazine Hydrochloride	0	-	0	-

“-“ means that polymerization yield is almost zero and thus, mean molecular weight could not be determined (if necessary, this data can be presented in declaration form)

The undersigned hereby declares as follows:

The undersigned further declares that all statements made herein of his or her own knowledge are true and that all statements made on information and belief are believed to be true; and that the foregoing statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

Date: May 20. 2009

By: B. K. Song  
Dr. SONG, Bong Keun